

**2016 Economic Impact of the Meat and Poultry Industry**

***Methodology and Documentation***

**Prepared for**

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## 2016 Economic Impact of the Meat and Poultry Industry

### Executive Summary

The *2016 Economic Impact of the Meat and Poultry Industry* measures the combined impact of the meat processing, poultry processing, rendering, hide and skin production, and offal production industries (hereafter meat and poultry products) to the U.S. economy in 2016. John Dunham & Associates (JDA) conducted this research, which was funded by the North American Meat Institute (NAMI). This work uses standard econometric models first developed by the U.S. Forest Service, and now maintained by IMPLAN Group, LLC. Data came from industry sources, government publications, Dun & Bradstreet, Inc, and Infogroup.

The industry is defined to include not only the production of meat and poultry based products, but meat and poultry wholesaling and retailing. The production process includes slaughtering, processing of meat and poultry products, rendering, hide and skin production, and offal production.

Once meat and poultry products have been produced or imported, they enter the second tier of the industry – the wholesaling tier. Wholesalers are involved in the transportation of meat and poultry products from the producers or from a bonded warehouse operated by importers, and the storage of products for a limited period of time.

The third tier of the industry is retailing, or directly selling products to the consumer. This can either be through on-premise sales (as in the case of a restaurant), or sales for off-premises consumption (grocery stores, butchers, etc.)

Industries are linked to each other when one industry buys from another to produce its own products. Each industry in turn makes purchases from a different mix of other industries, and so on. Employees in all industries extend the economic impact when they spend their earnings. Thus, economic activity started by the meat and poultry industry generates output (and jobs) in hundreds of other industries, often in sectors and states far removed from the original economic activity. The impact of supplier firms, and the “induced impact” of the re-spending by employees of industry and supplier firms, is calculated using an input/output model of the United States. The study calculates the impact on a national basis, by state, and by congressional district.

The study also estimates taxes paid by the industry and its employees. Federal taxes include industry-specific excise and sales taxes, business and personal income taxes, FICA, and unemployment insurance. Direct retail taxes include state and local sales taxes, license fees, and applicable gross receipt taxes. The meat and poultry industry pays real estate and personal property taxes, business income taxes, and other business levies that vary in each state and municipality. All entities engaged in business activity generated by the industry pay similar taxes.

The meat and poultry industry is a dynamic part of the U.S. economy, accounting for about **\$1.02 trillion in total economic output**, or roughly 5.6 percent of GDP.<sup>1</sup> Meat and poultry manufacturers, wholesalers, and retailers directly employed 1.87 million Americans in 2016. These workers earned over \$71.63 billion in wages and benefits. When supplier and induced impacts are taken into account, the meat and poultry industry is responsible for 5.44 million jobs in the United States and \$108.42 billion in direct

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<sup>1</sup> Based on 2015 GDP of \$18.2 trillion. See: “Gross Domestic Product: Fourth Quarter and Annual 2015 (Third Estimate)” *Bureau of Economic Analysis*. March 25, 2016. Available at: <https://www.bea.gov/newsreleases/national/gdp/gdpnewsrelease.htm>

federal, state and local taxes. In addition, consumers pay \$3.26 billion in state taxes imposed on meat and poultry products.<sup>2</sup>

## **Summary Results**

The *2016 Economic Impact of the Meat and Poultry Industry* measures the combined impact of the meat and poultry industry in the United States; including manufacturing, wholesaling, and retailing. The industry is defined to include meat and poultry slaughtering, processing, rendering, hide and skin production, and offal production industries, plus wholesaling and retailing. The industry contributes about \$1.02 trillion in total to the U.S. Economy, or 5.6 percent of GDP and, through its production and distribution linkages, impacts firms in 515 out of the 536 sectors of the US economy.<sup>3</sup>

**Table 1 – Economic Contribution of the Meat and Poultry Industry**

	<b>Direct</b>	<b>Supplier</b>	<b>Induced</b>	<b>Total</b>
Jobs (FTE)	1,871,987	2,003,952	1,565,146	5,441,085
Wages	\$71,630,322,700	\$104,905,068,700	\$81,000,810,300	\$257,536,201,700
Economic Impact	\$348,191,689,400	\$408,210,785,000	\$259,178,381,600	\$1,015,580,856,000
Taxes				\$108,422,103,200

The production process (as defined in this study) begins in one of four ways. In the case of slaughtering, livestock (including cows, pigs, sheep, goats, etc.) or poultry are purchased from farmers and brought to slaughterhouses for conversion into raw meat sides. Meat and poultry packers use either live animals (like chickens) or slaughtered meat products and convert these to either fresh or packaged meat or poultry. Alternatively, hides and skins are purchased from slaughterhouses and converted to raw (untanned) leather or fur products. Finally, offal such as livers, pancreases, and intestines are purchased from farmers, packers or slaughterhouses and processed for food or medical uses. Together, 7,753 firms comprise the production sector of the meat and poultry industry, and these firms employ over 527,019 people.<sup>4</sup>

Once meat and poultry products have been produced or imported, they enter the second tier of the industry – the wholesaling tier. Wholesalers are involved in the transportation of meat and poultry products from the producers or a bonded warehouse operated by importers, and the storage of products for a limited period of time. The meat and poultry industry is directly responsible for over 232,418 jobs in the wholesaling sector.

Finally, the third tier of the industry directly sells products to the consumer. For this analysis, the retail tier is assumed to consist of firms in the following industries: restaurants and taverns, grocery stores, meat and fish markets, fruit and vegetable markets, dairy products stores, retail bakeries and miscellaneous food stores. While there are obviously other venues that may sell meat and poultry products to the public – street vendors, cruise lines, non-profit groups, etc. – they are not included in the analysis due to limited data availability or the small amount of product that they handle. The meat and poultry industry is directly responsible for over 1.11 million jobs in the retailing sector.

Other firms are related to the meat and poultry industry as suppliers. These firms produce and sell a broad range of items including machinery, tools, parts, chemicals, and other materials needed to produce meat and poultry products. In addition, supplier firms provide a broad range of services, including personnel

<sup>2</sup> Local sales taxes paid on sales of meat and poultry products are not included in this analysis.

<sup>3</sup> Economic sectors based on IMPLAN sectors.

<sup>4</sup> Throughout this study, the term “firms” actually refers to physical locations. One meat company, for example, may have facilities in dozens of locations throughout the country. Each of these facilities is included in the 7,753 count.

services, financial services, advertising services, consulting services or transportation services. Finally, a number of people are employed in government enterprises responsible for the regulation of the meat and poultry industry. All told, we estimate that the meat and poultry industry is responsible for over 2 million supplier jobs. Supplier firms generate about \$408.21 billion in economic activity.<sup>5</sup>

An economic analysis of the meat and poultry industry will also take additional linkages into account. While it is inappropriate to claim that suppliers to the supplier firms are part of the industry being analyzed,<sup>6</sup> the spending by employees of the industry, and those of supplier firms whose jobs are directly dependent on the meat and poultry industry, should be included. This spending on everything from housing, to food, to educational services and medical care makes up what is traditionally called the “induced impact” or multiplier effect of the meat and poultry industry. In other words, this spending, and the jobs it creates are induced by the manufacturing and distribution of meat and poultry products. We estimate that the induced impact of the industry generates 1.57 million jobs and \$259.18 billion in economic impact, for a multiplier of 0.74.<sup>7</sup>

An important part of an impact analysis is the calculation of the contribution of the industry to the public finances of the country. In the case of the meat and poultry industry, the traditional direct taxes paid by the firms and their employees provide \$108.42 billion in revenues to the federal, state and local governments. These figures do not include state and local sales taxes paid on meat and poultry products.

Table 1 on the prior page presents a summary of the total economic impact of the industry in the United States. Summary tables for each state are included in the Output Model, which is discussed in the following section.

### **Output Model**

John Dunham & Associates produced the Economic Impact study for the North American Meat Institute (NAMI). The analysis consists of a number of parts, each of which will be described in the following sections of this document. These include data, models, calculations and outputs. These components were joined together into an interactive system that allows NAMI to examine the links between the various parts of the industry and to produce detailed output documents on an as-needed basis. As such, there is no book – no thick report – outlining the impact of the industry, but rather a system of models and equations that can be continuously queried and updated.

### **Economic Impact Modeling – Summary**

The Economic Impact Study begins with an accounting of the direct employment in the domestic manufacture and wholesaling of meat and poultry products. The data come from a variety of government and private sources.

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<sup>5</sup> Meat wholesaling and retailing are modeled using different data sources in this analysis when compared to the 2012 model. In 2012 JDA used zip code level employment data supplied by Dun & Bradstreet. In 2016, we have relied on zip code based employment data supplied by Infogroup, the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America. Infogroup gathers data from a variety of sources, by sourcing, refining, matching, appending, filtering, and delivering the best quality data. Infogroup verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

<sup>6</sup> These firms would more appropriately be considered as part of the supplier firm’s industries.

<sup>7</sup> Often economic impact studies present results with very large multipliers – as high as 4 or 5. These studies invariably include the firms supplying the supplier industries as part of the induced impact. John Dunham & Associates believes that this is not an appropriate definition of the induced impact and as such limits this calculation to only the effect of spending by direct and supplier employees.

It is sometimes mistakenly thought that initial spending accounts for all of the impact of an economic activity or a product. For example, at first glance it may appear that consumer expenditures for a product are the sum total of the impact on the local economy. However, one economic activity always leads to a ripple effect whereby other sectors and industries benefit from this initial spending. This inter-industry effect of an economic activity can be assessed using multipliers from regional input-output modeling.

The economic activities of events are linked to other industries in the state and national economies. The activities required to manufacture meat and poultry products generate the direct effects on the economy. Regional (or indirect) impacts occur when these activities require purchases of goods and services such as machinery or electricity from local or regional suppliers. Additional induced impacts occur when workers involved in direct and indirect activities spend their wages. The ratio between induced output and direct output is termed the multiplier.

This method of analysis allows the impact of local production activities to be quantified in terms of final demand, earnings, and employment in the states and the nation as a whole.

Once the direct impact of the industry has been calculated, the input-output methodology discussed below is used to calculate the contribution of the supplier sector and of the re-spending in the economy by employees in the industry and its suppliers. This induced impact is the most controversial part of economic impact studies and is often quite inflated. In the case of the NAMI model, only the most conservative estimate of the induced impact has been used.

### **Model Description and Data**

This analysis is based on data provided by the American Meat Institute, Dun & Bradstreet, Inc. (D&B, Inc.), Infogroup, the US Department of Agriculture (USDA), and various state agriculture departments. The analysis utilizes the IMPLAN Group, LLC's model in order to quantify the economic impact of the meat and poultry products industry on the economy of the United States.<sup>8</sup> The model adopts an accounting framework through which the relationships between different inputs and outputs across industries and sectors are computed. This model can show the impact of a given economic decision – such as a factory opening or operating a sports facility – on a pre-defined, geographic region. It is based on the national income accounts generated by the US Department of Commerce, Bureau of Economic Analysis (BEA).<sup>9</sup>

Producer employment is based on federal and state inspected facilities as of 2016. Data was gathered from the federal government and 27 states that inspect meat processors and slaughterhouses,<sup>10</sup> entered into a database, and physically located in a geographic analysis system. All told, there were 7,753 plants identified. These data provided the number of plants and the physical location; however, none of the government entities had employment data available. In order to estimate employment, federal and state inspected facilities were matched with employment data from D&B, Inc. or NAMI. For those establishments where a match could not be found econometric techniques were used to estimate an

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<sup>8</sup> The model uses 2014 input/output accounts.

<sup>9</sup> The IMPLAN model is based on a series of national input-output accounts known as RIMS II. These data are developed and maintained by the U.S. Department of Commerce, Bureau of Economic Analysis as a policy and economic decision analysis tool.

<sup>10</sup> These states are: Alabama, Arizona, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Minnesota, Mississippi, Missouri, Montana, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

employee count. All told, the number of estimated employees was within five percent of estimates from the actual employment levels as found in the IMPLAN tables.<sup>11</sup>

The IMPLAN Group model is designed to run based on the input of specific direct economic factors. It uses a detailed methodology (see IMPLAN Methodology section) to generate estimates of the other direct impacts, tax impacts and supplier and induced impacts based on these entries. In the case of the NAMI model, direct employment in the meat and poultry industry is a base starting point for the analysis. Direct employment is based on data provided to John Dunham & Associates by D&B, Inc. as of January 2016; and from industry data provided by NAMI. D&B data is recognized nationally as a premier source of micro industry data. The D&B database contains information on over 17 million businesses in the United States.<sup>12</sup> It is used extensively for credit reporting, and according to the vendor, encompasses about 98 percent of all business enterprises in the country. This data is gathered at the facility level; therefore, a company with a manufacturing plant, warehouse and sales office would have three facilities, each with separate employment counts. Since the D&B data are adjusted on a continual basis, staff from John Dunham & Associates scanned the data for discrepancies. In addition, for cases where employment data for NAMI member firms were available, D&B employment figures were replaced with those from NAMI. Employment data for meat and poultry wholesaling and retailing come from Infogroup, the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America. Infogroup gathers data from a variety of sources, by sourcing, refining, matching, appending, filtering, and delivering the best quality data. Infogroup verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

Once the initial direct employment figures have been established, they are entered into a model linked to the IMPLAN database. The IMPLAN data are used to generate estimates of direct wages and output. Wages are derived from data from the U.S. Department of Labor's ES-202 reports that are used by IMPLAN to provide annual average wage and salary establishment counts, employment counts and payrolls at the county level. Since this data only covers payroll employees, it is modified to add information on independent workers, agricultural employees, construction workers, and certain government employees. Data are then adjusted to account for counties where non-disclosure rules apply. Wage data include not only cash wages, but health and life insurance payments, retirement payments and other non-cash compensation. It includes all income paid to workers by employers.

Total output is the value of production by industry in a given state. It is estimated by IMPLAN from sources similar to those used by the BEA in its RIMS II series. Where no Census or government surveys are available, IMPLAN uses models such as the Bureau of Labor Statistics' growth model to estimate the missing output.

The model also includes information on income received by the Federal, state and local governments, and produces estimates for the following taxes at the Federal level: Corporate income; payroll, personal income, estate and gift, and excise taxes, customs duties; and fines, fees, etc. State and local tax revenues include estimates of: Corporate profits, property, sales, severance, estate and gift and personal income taxes; licenses and fees and certain payroll taxes.

While IMPLAN is used to calculate the state level impacts, Infogroup data provide the basis for Congressional district level estimates. Publicly available data at the county and Congressional district

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<sup>11</sup> IMPLAN employment levels are based on county employment data as reported by the US Department of Labor, Bureau of Labor Statistics.

<sup>12</sup> The D&B information database updates over 1 million times a day, over 350 million payment experiences are processed annually, and over 110 million phone calls are made to businesses. In addition, D&B uses a patented matching technology and over 2,000 information computer validations to ensure a high standard of data quality.

level is limited by disclosure restrictions, especially for smaller sectors of the economy. Our model therefore uses actual physical location data provided by Infogroup in order to allocate jobs – and the resulting economic activity – by physical address or when that is not available, zip code. For zips entirely contained in a single congressional district, jobs are allocated based on the percentage of total sector jobs in each zip. For zips that are broken by congressional districts, allocations are based on the percentage of total jobs physically located in each segment of the zip. Physical locations are based on either actual address of the facility, or the zip code of the facility, with facilities placed randomly throughout the zip code area. All supplier and indirect jobs are allocated based on the percentage of a state’s employment in that sector in each of the districts. Again, these percentages are based on Infogroup data.

### **IMPLAN Methodology**<sup>13</sup>

Francoise Quesnay one of the fathers of modern economics, first developed the analytical concept of inter-industry relationships in 1758. The concept was actualized into input-output analysis by Wassily Leontief during the Second World War, an accomplishment for which he received the 1973 Nobel Prize in Economics.

Input-Output analysis is an econometric technique used to examine the relationships within an economy.

It captures all monetary market transactions for consumption in a given period and for a specific geography. The IMPLAN model uses data from many different sources – as published government data series, unpublished data, sets of relationships, ratios, or as estimates. The Minnesota IMPLAN group gathers this data, converts it into a consistent format, and estimates the missing components.

There are three different levels of data generally available in the United States: Federal, state and county.

Most of the detailed data are available at the county level, but there are many issues with disclosure – especially in the case of smaller industries. IMPLAN overcomes these disclosure problems by combining a large number of datasets and by estimating those variables that are not found from any of them. The data is then converted into national input-output matrices (Use, Make, By-products, Absorption and Market Shares) as well as national tables for deflators, regional purchase coefficients and margins.

The IMPLAN Make matrix represents the production of commodities by industry. The Bureau of

Economic Analysis (BEA) Benchmark I/O Study of the US Make Table forms the bases of the IMPLAN model. The Benchmark Make Table is updated to current year prices, and rearranged into the IMPLAN sector format. The IMPLAN Use matrix is based on estimates of final demand, value-added by sector and total industry and commodity output data as provided by government statistics or estimated by IMPLAN. The BEA Benchmark Use Table is then bridged to the IMPLAN sectors. Once the re-sectoring is complete, the Use Tables can be updated based on the other data and model calculations of interstate and international trade.

In the IMPLAN model, as with any input-output framework, all expenditures are in terms of producer prices. This allocates all expenditures to the industries that produce goods and services. As a result, all data not received in producer prices is converted using margins which are derived from the BEA Input-Output model. Margins represent the difference between producer and consumer prices. As such, the margins for any good add to one. If, for example, 10 percent of the consumer price of meat is from the purchase of electricity, then the electricity margin would be 0.1.

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<sup>13</sup> This section is paraphrased from IMPLAN Professional: Users Guide, Analysis Guide, Data Guide, Version 2.0, MIG, Inc., June 2000.

Deflators, which account for relative price changes during different time periods, are derived from the Bureau of Labor Statistics (BLS) Growth Model. The 224 sector BLS model is mapped to the 536 sectors of the IMPLAN model. Where data are missing, deflators from BEA's Survey of Current Businesses are used.

Finally, the Regional Purchase Coefficients (RPCs) – essential to the IMPLAN model – must be derived. IMPLAN is derived from a national model, which represents the “average” condition for a particular industry. Since national production functions do not necessarily represent particular regional differences, adjustments need to be made. Regional trade flows are estimated based on the Multi-Regional Input-Output Accounts, a cross-sectional database with consistent cross interstate trade flows developed in 1977. These data are updated and bridged to the 536 sector IMPLAN model.

Once the databases and matrices are created, they go through an extensive validation process. IMPLAN builds separate state and county models and evaluates them, checking to ensure that no ratios are outside of recognized bounds. The final datasets and matrices are not released before extensive testing takes place.